

food is, for some reason or other, generally better adapted to meet the collective requirements of the human organism than an exclusively bread or other vegetable one, the testimony of common experience may be accepted as sufficient evidence. Whatever may prove to be the exact explanations of the benefits arising from a mixed animal and vegetable diet, it is at any rate pretty clear, that, independently of any difference in the physical, and perhaps even chemical relations of the nitrogenous compounds, they are essentially connected with the amount, the condition, and the distribution of the *fat* in the animal portions of the food.

Fat is the most concentrated respiratory, and of course fat-storing material also, which our food-stuffs supply. It cannot be doubted that, independently of the mere supply of constituents, the conditions of concentration, of digestibility, and of assimilability of our different foods must have their share in determining the relative values, for the varying exigences of the system, of substances which, in a more general or more purely chemical sense, may still justly be looked upon as mutually replaceable.

By the aid of chemistry it may be established that, in the admixture of animal food with bread, the relation (in respiratory and fat-forming capacity) of the non-flesh-forming to the flesh-forming substances will be increased, and, further, that in such a mixed diet the proportion of the non-flesh-forming constituents, which will be in the concentrated form, so to speak, of *fat itself*, will be considerably greater than in bread alone. Common experience also testifies to the fact of advantages so derived. It remains to Physiology to lend her aid to the full explanation of that which Chemistry and common usage have thus determined.

COMMUNICATIONS RECEIVED SINCE THE END OF THE SESSION.

- I. Note "On the Formation of the Peroxides of the Radicals of the Organic Acids." By B. C. BRODIE, F.R.S., Professor of Chemistry in the University of Oxford. Received July 22, 1858.

The researches of Gerhardt showed a close resemblance which exists between the monobasic organic acids and the metallic protoxides. We have the chloride of acetyl corresponding to the chloride of the

metal, and the hydrated and anhydrous acetic acid corresponding to the hydrated and anhydrous oxide. These investigations have been succeeded by others, which have had their origin in the consistent development of these ideas. The following discovery extends and completes these analogies. I have to add a new term to this series, of which hitherto no analogue has existed. This term is the peroxide of the organic radical,—the body which in the series of acetyl corresponds to the peroxide of hydrogen or barium in the series of the metal. Of these remarkable substances I have prepared two,—the peroxides of benzoyl and of acetyl; but the method by which these are procured is doubtless of extensive application, and we may consider ourselves as in possession of a class of bodies of a new order, the study of which cannot fail greatly to extend our knowledge.

These peroxides are prepared by the action of the anhydrous acid, or the corresponding chloride, upon the peroxide of barium. It is first necessary to prepare this peroxide in a pure condition. This is effected by precipitation of the solution of the peroxide of barium in hydrochloric acid by baryta water, and by drying *in vacuo* the precipitate thus obtained. The peroxide of barium thus procured is perfectly pure, with the exception of a trace of carbonate. In appearance it resembles magnesia.

To prepare the peroxide of benzoyl, the chloride of benzoyl and the peroxide of barium are taken in equivalent proportions and mixed in water. A mutual decomposition takes place; and a substance is formed which, after crystallization from anhydrous ether, gave the following results to analysis:—

Carbon	69·23
Hydrogen	4·10
Oxygen.....	26·67
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	100·00

The calculated numbers for the peroxide of benzoyl are

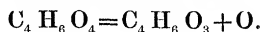
C ₁₄	168	·69·42
H ₁₀	10	4·13
O ₄	64	26·45
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	242	100·00

This substance contains an atom of oxygen more than the anhy-

drous acid, and (reducing the formula to its simplest expression) one atom of hydrogen less than the hydrated acid. Thus we have $C_{14}H_{10}O_3$ anhydrous benzoic acid, $C_{14}H_{10}O_4$ peroxide of benzoyl, and $C_7H_5O_2$ hydrated benzoic acid, $C_7H_5O_2$ peroxide of benzoyl, as we have H_2O water, and H_2O_2 or HO for the peroxide of hydrogen. This body crystallizes from ether in large and brilliant crystals. Heated a little above the boiling-point of water, it decomposes, with a slight explosion and the evolution of carbonic acid. Boiled with a solution of potash, it is resolved into oxygen gas and benzoic acid.

The peroxide of acetyl is prepared by mixing anhydrous acetic acid and peroxide of barium, in equivalent proportions, in anhydrous ether. The mixture is to be effected very gradually, being attended with evolution of heat. The ether, after filtration from the acetate of baryta produced, is to be carefully distilled off at a low temperature, and the fluid which remains washed with water. After three or four washings, the water ceases to be acid, and a viscid liquid remains, which is the peroxide of acetyl. This substance possesses the following properties:—It is extremely pungent to the taste; the smallest portion of it placed upon the tongue burns like cayenne pepper. The substance suspended in water immediately decolorizes a solution of sulphate of indigo. It instantly peroxidizes the protoxide of manganese, and converts the yellow prussiate of potash to the condition of red prussiate. Baryta-water poured upon the substance is converted to the condition of peroxide of barium, with formation of acetate of baryta. Lastly, a single drop of the substance itself, placed on a watch-glass and heated, explodes with a loud report, shivering the glass to atoms.

To analyse the peroxide of acetyl, I availed myself of its decomposition by baryta-water. An undetermined quantity of the substance was thus decomposed, and the oxygen estimated which was evolved by the decomposition of the peroxide of barium formed, by platina-black, and the acetate of baryta determined as sulphate. The result is the same as though the peroxide of acetyl were decomposed into anhydrous acetic acid and oxygen, thus,



Thus for every 16 parts of oxygen evolved, 2 equivalents of acetate

of baryta and 1 of sulphate of baryta, $\text{SO}_4 \text{Ba}_2$, would be produced. Now we have

$$\begin{array}{cccc} \text{SO}_4 \text{Ba}_2 & \text{O} & & \\ 233\cdot2 & : 16 & :: 100 & : 6\cdot86. \end{array}$$

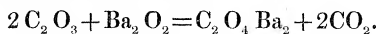
In the actual experiment 1·776 gr. of sulphate of baryta was obtained, and 0·1225 of oxygen evolved.

$$1\cdot776 : 0\cdot1225 :: 100 : 6\cdot89.$$

It has not yet been in my power to pursue further the study of these substances. I may, however, observe, that the peroxide of acetyl contains the elements of carbonic acid and of the acetate of methyl, and the peroxide of benzoyl the elements of carbonic acid and of the benzoate of phenyl. I have ascertained that the peroxide of benzoyl, when carefully heated, loses exactly one equivalent of carbonic acid; but the substance formed, although isomeric with the benzoate of phenyl, has not the properties of that body. It is a yellow resin, soluble in ether and alkalies, from which latter solution it is precipitated by acids.

The existence of a hydrated peroxide may be anticipated, intermediate between the organic peroxide and the peroxide of hydrogen, in the same sense as the organic acid is intermediate between water and the anhydrous acid. This substance in the series of benzoyl would be isomeric with salicylic acid. My efforts, however, to procure these bodies have, as yet, been unsuccessful; and it is to be remembered that we have no evidence of the existence of a hydrated peroxide of barium, or of any other metal, corresponding to the hydrated protoxide. In the series of ethyl the diatomic alcohol of Wurtz ($\text{C}_2 \text{H}_6 \text{O}_2$) is isomeric with the hydrated peroxide. But the true peroxide of ethyl remains yet to be discovered.

The question naturally arises as to what would be the result of making similar experiments with the chlorides and the anhydrides of the bibasic acids. Now carbonic acid may be regarded as the peroxide of oxalic acid: it is the constant product of the action of oxidizing agents upon that body; and were we able to procure the unknown anhydride of oxalic acid, it would not be an unreasonable anticipation that with the peroxide of barium it would decompose into oxalate and carbonic acid, thus



A similar experiment with anhydrous succinic acid would produce succinate of baryta and a homologue of carbonic acid, the existence of which is also indicated by other considerations. It is premature to dwell upon this point; but in this direction also I have made some experiments.

II. "Notice of Researches on the Sulphocyanide and Cyanate of Naphtyl, conducted by VINCENT HALL, Esq." By A. W. HOFMANN, Ph.D., F.R.S. &c. Received August 10, 1858.

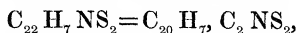
The transformation of phenylcarbamide and phenylsulphocarbamide under the influence of anhydrous phosphoric acid, respectively into cyanate and sulphocyanide of phenyl, an account of which I submitted to the Society several months ago, suggested the probability that the hitherto unknown cyanates and sulphocyanides of radicals similar to phenyl might be obtained by analogous processes.

To establish this point experimentally, Mr. Vincent Hall has examined, in my laboratory, the deportment of some of the derivatives of *naphtylamine* under the influence of agents capable of fixing ammonia and its analogues.

Mr. Hall has found that the crude naphtaline, such as it is obtained from the gas-works, submitted at once, without sublimation, to the action, first of fuming nitric acid, and subsequently of acetic acid and metallic iron, furnishes the naphtylamine sufficiently pure for these experiments. The crude product thus obtained was digested with bisulphide of carbon in order to convert it into *naphtylsulphocarbamide*.

By distilling naphtylsulphocarbamide with anhydrous phosphoric acid, Mr. Hall has obtained a beautiful crystalline compound of a faint but peculiar odour, readily fusible, easily soluble in alcohol and ether, insoluble in water.

The analysis of this compound has led to the formula



showing that it is in fact *sulphocyanide of naphtyl*, formed according to the equation:—

